Drought Response

Drought Contingency Planning

• Preparedness
• Near-Real-Time Implementation
• Implementation of DACPs – Institutional mechanism

Lead Agencies

State relief and disaster management departments, State departments of agriculture/horticulture/irrigation/watershed management, State seed corporations, State electricity boards, commercial and cooperative banks


Objective

To provide cropping and other options to the farmers to help withstand drought conditions
Preparedness

Careful advance preparation is critical to an effective response and containment of drought. The ambit of preparedness should extend to the following:

- Establishment of Drought Monitoring Centre at the State HQs
- Preparation of Agriculture Contingency Plans for districts/ sub-district levels, especially in vulnerable districts
- Identification of drought prone-areas preferably at the sub-district level
- Monitoring of seasonal forecasts of IMD and other national/international agencies
- Prepositioning of inputs like drought resilient variety seeds at strategic locations
- Activate agricultural extension to encourage shift to crops and varieties that are less water requiring and recommend agronomic practices that promote conservation of water and soil moisture
- Repair and maintenance of water bodies/tanks/wells etc. to help critical irrigation during dry spells
- Creation of drought contingency cells at districts to monitor dry spells
- Develop protocols for various departments to initiate contingency measures with clear allocation of responsibilities
Must – Do – Practices (MDPs) : Initial Preparedness

- Land Treatment
  - Sowing across slope
  - Ridge and furrow
  - Compartmental bunding
  - Broad bed furrow system
  - Raised bed/raised bed and sunken system and sunken bed etc

- Rainwater Harvesting & Efficient Use
  - Rainwater
  - Harvesting structures
  - Farm ponds
  - Percolation tank
  - Micro irrigation systems etc

- Suitable Crops/Varities Cropping systems
  - Seed bank
  - Seed treatment
  - Intercropping systems etc.
  - Agroforestry

- Need based Nutrient Management
  - Rainwater availability
  - Nutrients for foliar spray
  - Organic recycling
  - Tank silt application etc

- Suitable Farm Implements
  - Farm mechanization
  - Custom hiring centres
  - Labour sharing mechanization

- Fodder Systems
  - Silage
  - Household/Community Fodder Systems etc

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Preparedness

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Intercropping systems with *in situ* moisture conservation

Soybean + pigeonpea (4:2) with conservation furrow in Semiarid Vertisols

Parbhani centre

Opening of conservation furrow at 35 DAS after every 4 rows in soybean increased the yield by 15.6% of soybean and 17% in pigeonpea

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Near Real-Time Implementation of Contingency Plans

Preparedness measures like in-situ conservation, tank silt application etc. may help in overcoming dry spells, a scenario may still arise on account of long dry spells or senitiveness of crop which may warrant intervention by line departments.

"Any contingency measure, either technology related (land, soil, water, crop) or institutional and policy based, which is implemented based on real time weather pattern (including extreme events) in any crop growing season" is considered as Real Time Contingency Planning (RTCP).
Near Real-Time Contingency Plans: Implementation

Aim

i. To establish a crop with optimum plant population during the delayed onset of monsoon

ii. To ensure better performance of crops during seasonal drought (early/midseason and terminal drought and extreme events, enhance performance, improve productivity and income

iii. To minimize physical damage to livestock, poultry and fisheries sector and ensure better performance to ensure food security at village level and

iv. To enhance the adaptive capacity and livelihoods of the farmers
Role of States/Departments:

• To prepare agro-advisory bulletins in response to weather forecasts in consultation with State Agriculture./Horticulture/ Veterinary Universities and other Agricultural Institutes.

• To install, collect, analyze and utilize the rainfall information from sub-district levels i.e Tehsils/blocks/mandals etc. in order to address the issues of drought realistically.

• To ensure successful implementation of Agriculture Contingency Plans following support systems need to be put in place.

• To prepare agro-advisory bulletins based on crop contingency plans and widely disseminate them among farmers in drought affected region.

• The district advisory bulletins issued by IMD under Gramin Krishi Mausam Seva may also be consulted while preparing agro-advisory bulletins.
Delayed Onset of Monsoon: Contingency measures

In rainfed areas, early sowing of crops with the onset of monsoon

• Under delayed onset, do not encourage sowing of crops beyond SOWING WINDOW.

• Crops with wider sowing windows can still be taken up till the cut-off date without major yield loss.

• Beyond sowing window, choice of crops or varieties depends on farming situation, soil, rainfall and cropping pattern in the location and extent of delay in the onset of monsoon.

• Prefer short duration drought tolerant crops/varieties.
Early Season Drought: Contingency Measures

Majorly affects primary tillage, sowing, fertilizer application and intercultivation
Results in seedling mortality, poor germination/establishment/growth

The major measures include:

• Resowing of the same crop/variety
  • or alternate crop when germination is less than 30% within a week to 10 days with subsequent rains and under favourable soil moisture conditions

• Thinning in small seeded crops
• Gap filling along with popit watering when the crop stand is less than 75% in crops like cotton

• Interculture to break soil crust and remove weeds and create soil mulch for conserving soil moisture

• Avoid top dressing fertilizers

• Opening conservation furrows
Midseason Drought : Contingency Measures

Results in stunted growth if it occurs at vegetative stage and adversely effects yield if occurs at flowering or early reproductive stage

The major measures include:

• In-situ soil moisture conservation is vital
• Plant protection measures
• Avoid top dressing of fertilizer until favourable soil moisture condition
• Interculture
• Weed management
• Mulching
• Foliar spray of 2% KNO₃ or 2% urea
• Opening conservation furrows
• Supplemental irrigation
• Thinning
Terminal Drought: Contingency Measures

The major measures include:

• Plant protection
• Soil moisture conservation
• Supplemental irrigation
• Harvesting for fodder
• Preparation for rabi sowings in double cropped areas
• Contingency crops like horsegram/cowpea or dual purpose forage crops on receipt of showers
Implementation of District Agriculture Contingency Plans: Supporting Systems Needed

• Seed banks
• Fodder banks
• Nutrient banks
• Custom Hiring Centres
• Support to farmers
  • **Agricultural input support** – subsidized seeds of appropriate varieties for second sowing, folira sprays, supplemental irrigation etc.
  • **Energy support** – assured quality power supply for irrigation
  • **Extension support** – for timely agroadvisories, KVKs, ATMA, Kisan Call Centres, M-Kisan portal of DAC&FW, audio-conferencing of experts with farmers registered with KCCs and M-Kisan for timely advice
## Community Seed Banks (CSBs)

<table>
<thead>
<tr>
<th>NICRA Village</th>
<th>Crop</th>
<th>Variety</th>
<th>Qty (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Babulgaon (Parbhani)</td>
<td>Soybean</td>
<td>MAUS 71 &amp; MAUS 162</td>
<td>3640</td>
</tr>
<tr>
<td>Tedha (Varanasi)</td>
<td>Rice</td>
<td>NDR 97, 105 &amp; Susak Samrat</td>
<td>6000</td>
</tr>
<tr>
<td></td>
<td>Sesame</td>
<td>Swetha</td>
<td>3500</td>
</tr>
<tr>
<td>Nignoti &amp; Bishkedi (Indore)</td>
<td>Soybean</td>
<td>RVS201-04</td>
<td>4000</td>
</tr>
<tr>
<td>Kalimati &amp; Chandanki (Fodder) (SK Nagar)</td>
<td>Sorghum (Fodder)</td>
<td>CSV-21</td>
<td>2500</td>
</tr>
<tr>
<td>Tahkapal</td>
<td>Kodo millet</td>
<td>JK 48</td>
<td>417</td>
</tr>
<tr>
<td></td>
<td>Finger millet</td>
<td>GPU 28</td>
<td>366</td>
</tr>
</tbody>
</table>

**Fodder Banks**

Traditional rice varieties in Tahakpal village, Bastar district

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Chamua village, Assam
Role of Village Institutions

- Village Climate Risk Management Committees (VCRMCs)

VCRMC Meeting Jagdalpur

Biswanath Chariali (Assam)  
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Solapur Maharashtra

Ridge planter (SK Nagar, Gujarat)
Drought Mitigation

The short term measures are mostly reactive and relief centric and mostly in-season drought management.

Need for long term drought mitigation measures in drought prone areas:

- To adapt to climate change/variability
- For restoration of ecological balance, minimize land degradation etc.
- Long term measures include:
  - Soil and water conservation measures
  - Watershed management
  - Agronomic measures
  - Forest programmes
  
-Drought mitigation measures to be convergaed with Central govt. programmes/schemes like PMKSY, RKVY, NRAA, National Rural Drinking Water Programmes , Krishi Bhagya, Watershed development, NHM etc.
- Current drought mitigation programmes include PMKSY, MGNREGS etc.
### Drought proofing measures

<table>
<thead>
<tr>
<th>Rainfall and Production system</th>
<th>Indigenous technology</th>
<th>Exogenous technology</th>
<th>Insitu water conservation</th>
<th>Modern technology</th>
<th>Annual covers</th>
<th>Erosion filters</th>
<th>Perennial Covers</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>&lt;500 mm arid</strong> Nutritious cereals, oilseeds and pulses Sheep, goat, buffaloes</td>
<td>Khadis, Tankas</td>
<td>100 to 200 m³ ponds, Crop life saving irrigation</td>
<td>Water harvesting</td>
<td>Inter-plot water harvesting Dead furrows</td>
<td>Sole crop to intercrops and mixed crops</td>
<td>Lasurus sindicus</td>
<td>Wind breaks</td>
</tr>
<tr>
<td><strong>500-1000 mm Semi arid</strong> Nutritious cereals, Cotton, Oilseeds and Pulses, Buffaloes, Goats, Sheep, cattle</td>
<td>Tanks, Field bunds</td>
<td>200-1000 m³ ponds Supplemental irrigation</td>
<td>Contour bunds</td>
<td>Compartmental bunding Zing terracing Broad bed and furrow Vertical mulching</td>
<td>Intercrops sole rabi crop Sequence crops</td>
<td>Cenchrus setigerus C. ciliaris Chry sopogon fulvus</td>
<td>Alley cropping</td>
</tr>
<tr>
<td><strong>&gt;1000 mm Sub humid</strong> Rainfed rice, Haveli, Nutritious Choes, Deep cereals, Pulses, water Paddy, Buffaloes, cattle, Low and mid pigs, ducks</td>
<td>Submergence</td>
<td>&gt;1000 m³ ponds for alternate Land uses Streamlets Amelioration of drainage by summer irrigation</td>
<td>Raised and sunken beds Bunding of uplands Drainage channels</td>
<td>Rice cropping Paras relay cropping</td>
<td>Intercrops Sequence cropping</td>
<td>Dichanthium macrostachyum</td>
<td>Forestry</td>
</tr>
</tbody>
</table>

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Drought Mitigation Measures

Water Harvesting and Conservation

• Contour bunding
• Contour trenching
• Contour cultivation
• Bench terracing
• Graded bunding
• Gully plugging
• Check dams/nala bunding
• Gabion structures
• Stream bank protection
• Farm ponds
• Percolation tanks
• Anicuts
• Sub-surface barriers
• Injection wells
Traditional water harvesting and conservation

• Dug well recharge, Village pond/tank, Tankas/Kunds/Kundis, Khadin
• Hill slope collection
• Spring water harvesting

Rainwater Harvesting in Urban areas

Water saving technologies
• Drip/sprinkler irrigation systems, Improved water saving practices

Long–term irrigation management

• At reservoir level: Monitoring reservoirs, Setting up Water User Associations
• Conjunction use of surface and groundwater, Prevention of evaporation losses from reservoirs, Increasing storage of reservoirs, Integrating major reservoirs with small reservoirs, inter-basin-transfer of water

Afforestation

Crop Insurance

Community participation in Drought mitigation

Climate variability and adaptation

Power supply in vulnerable areas

Public distribution systems

Indigenous knowledge

Awareness and Capacity building

Monitoring of Drought mitigation

Drought vulnerability and risk mapping
Artificial Recharging of Open/Borewells: Models Developed at Parbhani, Bengaluru

Parbhani centre model

Schematic view of Artificial well recharging system.

Demonstrated on 10 farmers fields in participatory mode in NICRA village, Parbhani district

Project supported material cost / Farmer: Rs. 10030/-

Farmer’s contribution: Rs. 2500/-
Decision Support Systems for Drought Management

Establishment of AWSs, rain gauges, data related to soil, crop, vegetation, water resources

Impact Assessment and Evaluation

Promote Education and Awareness of Mitigation Policies and Measures

Encourage Community level Plans for Drought Mitigation
Timely Agro-advisories

Weekly twice - Weather bulletins; SMS through mobile phones; All India Radio; Print media

Trainings/Field Days